CS 209
Data Structures and Mathematical Foundations

01 / 24 / 2024

Instructor: Michael Eckmann

Today's Topics

- Introduction of myself
- Slight Review the syllabus
- List of Topics we'll cover
- Start Python review
  - Variables
  - User Input
  - Function definitions
  - Etc.

Who is your instructor?

- I'm Mike Eckmann and I have taught at Skidmore since 2004. Before that I was at Lehigh University in PA.

- I studied Mathematics, Computer Engineering and Computer Science all at Lehigh University.

- I was employed as a programmer (systems analyst) for eight years.

Welcome email

- Later today (or tomorrow), I will send all the students in the course an email with
    - a link to the course webpage
    - a questionnaire that you should fill out and send back to me before Friday's class
- I'll use theSpring for you to submit homeworks

Syllabus

- Office hours (TBD)

- Readings

- Class meetings (time / room)

- Assignments

  - Hw's & programs

- Collaboration policy

- Grading schema

- Attendance

http://meckmann.domains.skidmore.edu/2024Spring/cs209/index.html

The most up-to-date syllabus will be found on the course web page.

Syllabus – course topics

- The course, as the title suggests is a course about data structures and algorithms that work efficiently on the data structures and the mathematical foundations of algorithms.

- Topics-
    - Python review (and learn object oriented style – creating our own classes)
    - Asymptotic Algorithm Analysis
        - Big O, Big Theta, etc.
    - Proof by Induction
    - Linked Lists
    - Trees
        - General trees
        - Binary trees
        - Traversals

Syllabus – course topics

- Topics continued
  - Binary Search trees
  - Recursion, Recurrence Relations
  - Divide and Conquer
    - Merge Sort
  - Stacks
  - Queues
  - Priority Queues
  - Quicksort algorithm
  - Hash tables
  - Balanced Binary Search Trees
  - Graphs and some graph algorithms

Suggestions on how to succeed in this (or any? CS) course

- Your job is to learn the material.

- When reviewing the material taught in class (whether or not it is an assigned homework) --- you need to figure out whether you understand it fully or whether there is something you do not fully understand.

  - If you have questions, please ask me. The first bullet of almost every lecture slides is asking you if there are Questions/Comments?

Python review

- What is a variable?

    – How to create a variable?

    – How to change the value of a variable?

    – How to "read / access" a value of a variable?

- What is a type? Do variables have a type?

- Can we create our own types in Python?

Python review

- A program's statements will execute sequentially, starting at the top. One statement after another will execute (read top to bottom) unless the program flow is somehow altered.

- Name some ways the program flow can change from sequentially proceeding from top to bottom?

python review

- printing
- Getting user input (what type does input return?)
- if / elif / else statements
- loops (for, while)

python review

- Let's write a program that is a guessing game. The user will be tasked with guessing a random number from 1 to some upper limit (inclusive.)

- We ask the user for the upper limit

- Program generates a random number from 1 to that upper limit.

- Ask the user to repeatedly guess until they guess it correctly or give up. What python construct will we use to repeatedly get guess?

python review

- Revisions: tell user whether their guess was too high or too low or correct.